

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

Listing of Claims:

Claim 1 (Currently Amended): A system for estimating quantities of pollutant compounds emitted in the exhaust gases of a diesel engine of a motor vehicle, comprising means for regenerating a solid particulate filter, an electronic control unit for managing the engine operation comprising data memories, ~~characterized in that it comprises~~ and further comprising:

[[-]] one or more neural networks (1);

[[-]] input data (2) representative of the engine operation and, optionally, of the vehicle movement, said data (2) being available in the electronic control unit for managing the engine operation without adding a sensor; and

[[-]] means (4) for cumulating the estimated quantities (3).

Claim 2 (Currently Amended): The system as claimed in claim 1, ~~characterized in that it comprises~~ comprising 10 to 15 neurons.

Claim 3 (Currently Amended): The system as claimed in either of claims 1 and 2, ~~characterized in that it comprises~~ further comprising training databases of the neural network, ~~or networks (1)~~ said databases being vehicle drive sequences of at least a few minutes.

Claim 4 (Currently Amended): The system as claimed in ~~any one of claims 1 to 3~~
~~characterized in that~~ claim 1, wherein the data used at the input of the neural network or
networks (4) comprise at least one of the following parameters:

[[-]] the engine speed (7) at two consecutive times t and $t - \Delta t$;

[[-]] the fuel flow rate (8) at three consecutive times t , $t - \Delta t$ and $t - 2\Delta t$;

[[-]] the engine coolant (9) temperature; and

[[-]] the vehicle speed (10) at time t ;

where Δt is the preset time interval between two consecutive measurement times and
~~characterized in that it comprises~~ further comprising means for estimating at least the
cumulative quantity (16) of the soot in the exhaust gases which will be retained by the
particulate filter.

Claim 5 (Currently Amended): The system as claimed in ~~any one of claims 1-4,~~
~~characterized in that~~ claim 1, wherein the data used at the input of the neural network or
networks (4) comprise at least one of the following parameters:

[[-]] the engine speed (7) at two consecutive times t and $t - \Delta t$;

[[-]] the fuel flow rate (8) at three consecutive times t , $t - \Delta t$ and $t - 2\Delta t$;

[[-]] the engine coolant (9) temperature; and

[[-]] the fuel-air ratio (18) of the mixture at time t ;

where Δt is the preset time interval between two consecutive measurement times and
~~characterized in that it comprises~~ further comprising means (15) for estimating at least the
cumulative quantity (16) of the soot in the exhaust gases which will be retained by a
particulate filter.

Claim 6 (Currently Amended): The system as claimed in ~~any one of claims 1 to 5~~
claim 1, adapted to an engine with common rail injection, ~~characterized in that~~ wherein the
data used at the input of the neural network or networks (1) at time t comprise at least one of
the following parameters:

[[-]] the fuel preinjection rate (19) in the engine;

[[-]] the main (2) fuel injection rate in the engine;

[[-]] the relative displacement (21) of a piston with respect to top dead center from the
time when the last fuel injection in the piston cylinder started;

[[-]] the relative displacement (22) of a piston with respect to top dead center from the
time when the last main fuel injection in the piston cylinder started;

[[-]] the engine coolant temperature (9);

[[-]] the engine air feed rate (23);

[[-]] the pressure (24) inside the common rail; and

[[-]] the engine speed (7);

and ~~in that~~ wherein the estimated quantities of pollutant compounds comprise at least
one of the following quantities:

[[-]] the cumulative quantity (16) of the soot in the exhaust gases that will be retained
by a particulate filter;

[[-]] the cumulative quantity (35) of nitrogen oxides in the exhaust gases;

[[-]] the cumulative quantity (31) of the carbon oxides in the exhaust gases; and

[[-]] the cumulative quantity (27) of hydrocarbons in the exhaust gases.

Claim 7 (Currently Amended): The system as claimed in ~~any one of claims 1 to 6,~~
~~characterized in that~~ claim 1, wherein no output (3,5) from the system is looped to an input
(2) of the system to avoid any problem of stability.

Claim 8 (Currently Amended): The system as claimed in ~~any one of claims 1 to 7,~~
~~characterized in that it comprises~~ claim 1, further comprising means for resetting the
estimated quantities of particulates, independently of each other.

Claim 9 (Currently Amended): A method for evaluating a system ~~implementing any~~
~~one of claims 1 to 8, characterized in that it evaluates~~ of claim 1, said method comprising the
step of evaluating the best configuration of the neural network or networks (1) by calculating
the error on the output quantities (3) by cumulation on a sliding window.

Claim 10 (Currently Amended): The method as claimed in claim 9, ~~characterized in~~
~~that~~ comprising the step of determining the sliding window ~~is determined~~ so that its size is
minimal while allowing an estimation error lower than a preset value.

Claim 11 (Currently Amended): The method as claimed in claim 10, ~~characterized in~~
~~that~~ wherein the size of the window corresponding to a vehicle movement varies between 0.5
km and 1.5 km to allow an estimation error of not more than 5 g of solid particulates emitted
per 135 km traveled by the vehicle.

Claim 12 (Currently Amended): The method as claimed in ~~any one of claims 9 to 11,~~
~~characterized in that~~ claim 9, comprising the step of discarding part of the data reserved for

training the neural network or networks ~~(1) is discarded~~ to perform a validation without the data used.

Claim 13 (Currently Amended): ~~The application of the system as defined in either of claims 6 and 7, to control~~ A method of controlling the means for regenerating the solid particulate filter ~~of either claims 6 and 7, the method comprising the step of comparing using a comparison between~~ the estimated quantity of cumulative soot ~~(16) and~~ with a memorized threshold value.

Claim 14 (Currently Amended): ~~The application of the system as defined in claim 8, to aid the calibration of~~ A method of calibrating engine control strategies ~~from the estimation of the~~ comprising a step of estimating engine emissions over a vehicle drive cycle, wherein said estimating step is performed with the system as defined in claim 8.